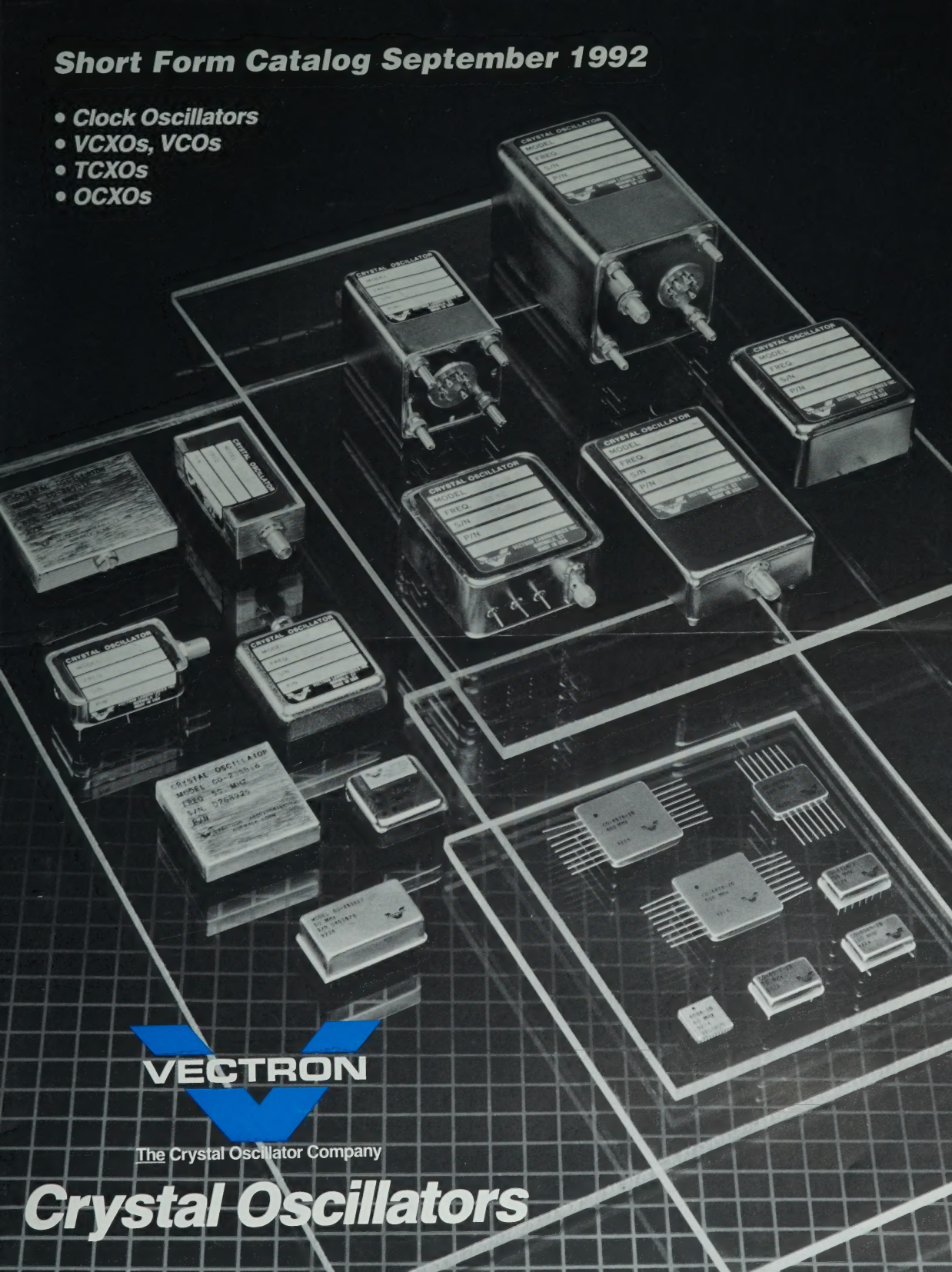
Short Form Catalog September 1992

- Clock Oscillators
- VCXOs, VCOs
- TCXOs
- OCXOs



VECTRON

The Crystal Oscillator Company

Crystal Oscillators

Clock Oscillators

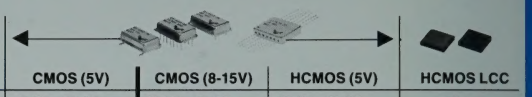
TTL

	DIP, FLATPACK & SURFACE MOUNT		LCC
Series	**CO-401:** 4 Pin DIP **CO-402:** 14 Pin DIP **CO-406:** Surface Mount **CO-407:** Flatpack	**CO-238**	**CO-408**
Frequency	16 kHz-100 MHz	16 kHz-70 MHz	1 MHz-60 MHz
Output	Drives 10 TTL loads (above 50 MHz, CO-238 drives 2 Schottky loads).		
Supply	5 Vdc ±5% at 30-90 mA depending upon frequency.		
Accuracy (at 25°C)	**CO-40** ☐ **A:** ±50 ppm **CO-40** ☐ **C:** ±25 ppm **CO-40** ☐ **D:** ±15 ppm **CO-40** ☐ **B:** ±10 ppm ***CO-40** ☐ **E:** ±1 ppm 1 for 4 pin DIP 2 for 14 pin DIP 6 for surface mount 7 for flatpack *Set to ±1 ppm via external capacitor (≤20 MHz only)	**CO-238A:** ±50 ppm **CO-238C:** ±25 ppm **CO-238D:** ±15 ppm **CO-238B:** ±10 ppm ***CO-238T:** ±1 ppm **Tuning adjust settable to ±1 ppm; available 16 kHz-30 MHz	**CO-408A:** ±50 ppm **CO-408C:** ±25 ppm
Temperature Stability	**STANDARD:** 0°C to +70°C: ±25 ppm Option **1:** −55°C to +85°C: ±50 ppm Option **2:** −55°C to +125°C: ±50 ppm Option **3:** 0°C to +50°C: ±3 ppm (only in CO-238) Option **5:** 0°C to +50°C: ±5 ppm Option **6:** 0°C to +50°C: ±10 ppm Option **7:** −55°C to +125°C: ±100 ppm ***Option **9:** −55°C to +200°C: ±300 ppm (only in CO-401/2/6/7 in 4-20 MHz range) ***Specified stability includes initial accuracy: do not specify A, B, C, D or E		
Aging Rate (typical after 30 days)	3 ppm first year 2 ppm/year thereafter	5 ppm first year, 3 ppm/year thereafter Opt "**Y**": 1 ppm/year	3 ppm first year 2 ppm/year thereafter
Size	†CO-401: 0.5" x 0.8" x 0.2" CO-402: 0.5" x 0.8" x 0.2" CO-406: 0.5" x 0.8" x 0.25" ††CO-407: 0.6" x 0.8" x 0.17" †CO-401 Series available with insulated standoffs; height increases to 0.23" ††0.12" opt. to 20 MHz	0.5" x 0.8" x 0.35"	0.48" x 0.48" x 0.085"
Case	Resistance welded metal case	Epoxy Case	Sealed ceramic leadless chip carrier

● Available as QPL to MIL-O-55310/16B&S

Improved accuracy/stability available on some models, (e.g. f_0 ±7 ppm:0/50°C; f_0 ±10 ppm:0/70°C). Improvement over wider temp. ranges also available. Please contact factory.

CMOS/HCMOS



	CMOS (5V)	CMOS (8-15V)	HCMOS (5V)	HCMOS LCC
Series	**CO-421:** 4 Pin DIP **CO-422:** 14 Pin DIP **CO-426:** Surface Mount **CO-427:** Flatpack	**CO-411:** 4 Pin DIP **CO-412:** 14 Pin DIP **CO-416:** Surface Mount **CO-417:** Flatpack	**CO-441:** 4 Pin DIP **CO-442:** 14 Pin DIP **CO-446:** Surface Mount **CO-447:** Flatpack	**CO-448**
Frequency	1 Hz-8 MHz	1 Hz-15 MHz	1 Hz-125 MHz	12.5 MHz-50 MHz
Output	Standard CMOS	Standard CMOS	HCMOS/ACMOS	HCMOS
Supply	5 Vdc ±5%	8-15 Vdc	5 Vdc ±5% (3 Vdc opt. to 20 MHz)	5 Vdc ±5%
Accuracy (at 25°C)	**CO-42** ☐ **A:** ±50 ppm **CO-42** ☐ **C:** ±25 ppm **CO-42** ☐ **D:** ±15 ppm **CO-42** ☐ **B:** ±10 ppm ***CO-42** ☐ **E:** ±1 ppm	**CO-41** ☐ **A:** ±50 ppm **CO-41** ☐ **C:** ±25 ppm **CO-41** ☐ **D:** ±15 ppm **CO-41** ☐ **B:** ±10 ppm ***CO-41** ☐ **E:** ±1 ppm	**CO-44** ☐ **A:** ±50 ppm **CO-44** ☐ **C:** ±25 ppm **CO-44** ☐ **D:** ±15 ppm **CO-44** ☐ **B:** ±10 ppm ***CO-44** ☐ **E:** ±1 ppm	**CO-448A:** ±50 ppm **CO-448C:** ±25 ppm
	1 for 4 pin DIP 2 for 14 pin DIP 6 for surface mount 7 for flatpack *Settable to ±1 ppm via external capacitor (≤20 MHz only)			
Temperature Stability	**STANDARD:** 0°C to +70°C: ±25 ppm Option **1:** −55°C to +85°C: ±50 ppm Option **2:** −55°C to +125°C: ±50 ppm Option **5:** 0°C to +50°C: ±5 ppm Option **6:** 0°C to +50°C: ±10 ppm Option **7:** −55°C to +125°C: ±100 ppm *Option **9:** −55°C to +200°C: ±300 ppm (only to 20 MHz; N/A in CO-448) *Specified stability includes initial accuracy; do not specify A, B, C, D or E			
Aging Rate (Typical after 30 days)	3 ppm first year 2 ppm/year thereafter			
Size	†CO-411/421/441: 0.5" x 0.8" x 0.2" CO-412/422/442: 0.5" x 0.8" x 0.2" CO-416/426/446: 0.5" x 0.8" x 0.25" ††CO-417/427/447: 0.6" x 0.8" x 0.17" †4 Pin DIP Series available with insulated standoffs; height increases to 0.23" ††0.12" height optional to 20 MHz			0.48" x 0.48" x 0.085"
Case	Resistance Welded Metal Case			Sealed ceramic leadless chip carrier

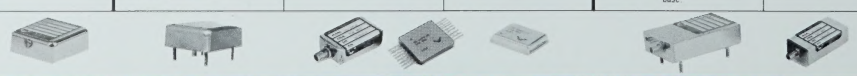
● Available as QPL to MIL-O-55310/18B

Improved accuracy/stability available on some models, (e.g. f_0 ±7 ppm:0/50°C; f_0 ±10 ppm:0/70°C). Improvement over wider temp. ranges also available. Please contact factory.

Sinewave Oscillators

	50 Hz to 4 MHz	4 MHz to 500 MHz			500.1 MHz to 2.6 GHz	
Series	*Low Frequency* **CO-281**	*Basic Line* **CO-233 (H, F, FW)**	*Reduced Size Line* **CO-285W** (SMA) **CO-285P** (pcb mt.)	*Miniature Hybrid* **CO-484** (DIP) **CO-487** (Flatpack)	*Reduced Size Line* **CO-286W** (SMA) **CO-286P** (pcb mt.)	*Very High Freq.* **CO-287W**
Frequency	50 Hz to 4 MHz	4 MHz to 500 MHz	4 MHz to 500 MHz	4 MHz to 500 MHz	500.1 MHz to 1.3 GHz	1.31 GHz to 2.6 GHz
Output	Std: >1Vrms/1 kΩ Opt: >0 dBm/50Ω to +20 dBm/50Ω	Standard: >0.5 Vrms/50Ω (+7 dBm) Option **R**: >1 Vrms/50Ω (+13 dBm) High level option: 1 watt (+30 dBm) available in 2" x 3" x ¾" package Model CO-284W.			Standard: >0.5 Vrms/50Ω (+7 dBm) Option **R**: >1 Vrms/50Ω (+13 dBm) High Output opt.: +20 dBm/50Ω to 1.3 GHz (in 2" x 3" x ¾" pkg.)	
Supply	+15 Vdc ±5%	+15 Vdc ±5% (Any supply in 12-24 Vdc range optional; supply less than 15 Vdc subject to reduced output level)			+15 Vdc ±5%	
Accuracy (at 25°C)	Standard: ±10 ppm *Option "**T**": ±1 ppm	Standard: ±10 ppm *Option "**T**": ±1 ppm	Standard: ±10 ppm *Option "**T**": ±1ppm	**CO-484A**: ±50 ppm **CO-484C**: ±25 ppm **CO-484D**: ±15 ppm **CO-484B**: ±10 ppm	Standard: ±10 ppm *Option "**T**": ±1 ppm *Tuning adjust settable to ±1 ppm	
	*Tuning adjustment settable to ±1 ppm					
Temperature Stability	**Standard**: 0°C to +70°C: ±25 ppm Option **1**: −55°C to +85°C: ±50 ppm Option **2**: −55°C to +125°C: ±50 ppm (not available in CO-284W, CO-287W) Option **3**: 0°C to +50°C: ±3 ppm (not available in CO-284W, CO-484, CO-487, CO-287W) Option **4**: 0°C to +50°C: ±1 ppm (only in CO-281) Option **5**: 0°C to +50°C: ±5 ppm Option **6**: 0°C to +50°C: ±10 ppm For higher stability, see sections describing Vectron TCXOs and oven-controlled types.					
Aging Rate (after 30 days)	Standard: 5 ppm first year, 3 ppm per year thereafter Option **Y**: 2 ppm first year, 1 ppm per year thereafter			3 ppm first year 2 ppm per year thereafter	Standard: 5 ppm first year, 3 ppm per year thereafter Option **Y**: 2 ppm first year, 1 ppm per year thereafter	
Phase Noise (typical 4-100 MHz)	Offset from Carrier / Standard / *Option L1 / **Option L2 100 Hz / −100 dBc/Hz / −115 dBc/Hz / −120 dBc/Hz 1 kHz / −125 dBc/Hz / −140 dBc/Hz / −145 dBc/Hz 10 kHz / −140 dBc/Hz / −150 dBc/Hz / −160 dBc/Hz 50 kHz / −145 dBc/Hz / −155 dBc/Hz / −160 dBc/Hz Noise degrades by 6 dB per octave above 100 MHz *L1 Option is not available in CO-281, CO-484, CO-487, CO-284W **L2 Option is available only in CO-233FW and is limited to 200 MHz; above 100 MHz, output of CO-233FWL2 is restricted to +7 dBm					
Size	2" x 2" x ¾" 2" x 2" x ½" optional	CO-233, CO-233H: 1½" x 1½" x ⅝" CO-233F, CO-233FW: 2" x 2" x ¾"	1" x 1.6" x 0.5"	CO-484: 0.8" x 1.0" x 0.20" CO-487: 1" x 1" x 0.17"	CO-286W(P): 1" x 2" x 0.6" High output opt: 2" x 3" x ¾"	2" x 2½" x ½"
Configuration	pins for pcb mount Option "**W**": SMA connector Option "**U**": SMC connector Option "**X**": BNC connector	CO-233: (4-149 MHz) pcb mount CO-233H: (150-300 MHz) pcb mount CO-233FW: (4-500 MHz) SMA connector, terminals and studs on base. CO-233F: (4-500 MHz) pcb mount	CO-285W: terminals on base SMA on side CO-285P: pcb mount without SMA connector	CO-484: 16 pin double DIP CO-487: 16 pin flatpack	CO-286W: SMA on 1" x 2" side, terminals on base CO-286P: pcb mount without SMA High output opt: SMA and pins on 2" x ¾" side; studs on base.	SMA on side terminals on base

NEW! NEW! NEW!



To order Vectron Crystal Oscillators or for Engineering Assistance…call (203) 853-4433

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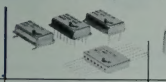
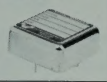
QPL to MIL-0-55310/25/26 coming in 1992

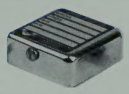
ECL

CO-434 (200-300 MHz) and CO-454 (200-625 MHz) available in 1" x 1" x 0.17" flatpack.

	10K, 10KH, MECLIII		100K ECL, ECLinPS	
				
Series	**CO-431:** 4 Pin DIP **CO-432:** 14 Pin DIP **CO-434:** 16 Pin Double DIP **CO-436:** Surface Mount **CO-437:** Flatpack	**CO-233ME** **CO-233MEH**	**CO-451:** 4 Pin DIP **CO-452:** 14 Pin DIP **CO-454:** 16 Pin Double DIP **CO-456:** Surface Mount **CO-457:** Flatpack	CO-233KEQ
Frequency	CO-434: 200.1 MHz to 300 MHz Other models: 5.0 MHz to 200 MHz		CO-454: 200.1 MHz to 625 MHz CO-233KEQ: 150.0 MHz to 700 MHz Other: Models: 5.0 MHz to 200 MHz	
Output	Output taken directly from 10K, 10KH or MECLIII gate, depending on frequency. Complementary outputs optional (Standard in CO-434)		≤400 MHz: 100K ECL >400 MHz: ECLinPS Complementary outputs standard in CO-454, optional in CO-452 and CO-457	≤400 MHz: from 100K gate >400 MHz: from ECLinPS gate complementary outputs
Supply	−5.2V ±5%: < 40 mA from 5 to 110 MHz < 60 mA above 110 MHz		Standard: −4.5V ±5% at <60 mA Option **F**: −5.2V ±5% at <70 mA	
Accuracy (at 25°C)	**CO-43** ☐ **A:** ±50 ppm **CO-43** ☐ **C:** ±25 ppm **CO-43** ☐ **D:** ±15 ppm **CO-43** ☐ **B:** ±10 ppm ☐ 4 pin DIP 2 14 pin DIP 4 double DIP 6 surface mount 7 flatpack	5-149.9 MHz models **CO-233ME:** ±10 ppm ***CO-233MET:** ±1 ppm *Tuning adjust settable to ±1 ppm 150-200 MHz models: **CO-233MEHA:** ±50 ppm **CO-233MEHB:** ±10 ppm	**CO-45** ☐ **A:** ±50 ppm **CO-45** ☐ **C:** ±25 ppm **CO-45** ☐ **D:** ±15 ppm **CO-45** ☐ **B:** ±10 ppm ☐ 4 pin DIP 2 14 pin DIP 4 double DIP 6 surface mount 7 flatpack	**CO-233KEQ:** ±10 ppm ***CO-233KEQT:** ±1 ppm *Tuning adjust settable to ±1 ppm with ±5 ppm nominal range; available to 500 MHz.
Temperature Stability	**STANDARD:** 0°C to +70°C: ±25 ppm Option **1:** −55°C to +85°C: ±50 ppm (See * note regarding temperature restrictions) Option **2:** −55°C to +125°C: ±50 ppm (See * note regarding temperature restrictions) Option **3:** 0°C to +50°C: ±3 ppm (Only available in Model CO-233ME and CO-233KEQ) Option **5:** 0°C to +50°C: ±5 ppm Option **6:** 0°C to +50°C: ±10 ppm Option **7:** −55°C to +125°C: ±100 ppm (See * note regarding temperature restrictions) *−1, −2, −7 restricted to −30/+85°C above 200 MHz in CO-431/2/4/6/7 and above 110 MHz in CO-233ME. −1, −2, −7 restricted to 0/+85°C in 100K and ECLinPS models. These restrictions are due to specified limits by the i.c. manufacturer. Wider temp. ranges coming in 1992.			
Aging Rate (typical after 30 days)	3 ppm first year 2 ppm/year thereafter	5 ppm first year 3 ppm/year thereafter Opt. "**Y**": 1 ppm/year	3 ppm first year 2 ppm/year thereafter	5 ppm first year 3 ppm/year thereafter Opt. "**Y**": 1 ppm/year
Size	#CO-431: 0.5" x 0.8" x 0.2" CO-432: 0.5" x 0.8" x 0.2" CO-434: 0.8" x 1.0" x 0.2" CO-436: 0.5" x 0.8" x 0.25" CO-437: 0.6" x 0.8" x 0.17"	1.5" x 1.5" x 0.625" CO-233ME: 4 pin base CO-233MEH: 5 pin base	#CO-451: 0.5" x 0.8" x 0.2" CO-452: 0.5" x 0.8" x 0.2" CO-454: 0.8" x 1.0" x 0.2" CO-456: 0.5" x 0.8" x 0.25" CO-457: 0.6" x 0.8" x 0.17"	1.5" x 1.5" x 0.5"
Case	resistance welded metal case #CO-431 available with insulated standoffs; increases height to 0.23"	metal case "**C**" option: meets gross leak test	resistance welded metal case #CO-451 available with insulated standoffs; increases height to 0.23"	metal case "**C**" option: meets gross leak test

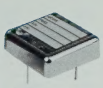
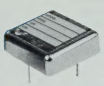
Improved accuracy/stability available on some models (e.g. ±7 ppm 0/50°C, ±10 ppm 0/70°C). Improvement over wider temp ranges also available. Please contact factory.

VCOs Non-Crystal Oscillators



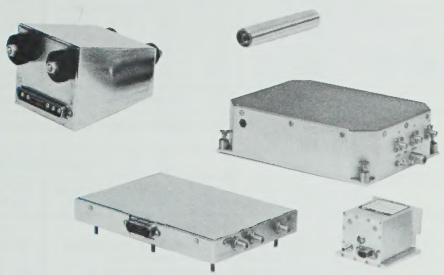
Series	VC-381	VC-371	VC-373
Center Frequency	10 Hz to 500 kHz	500 kHz to 500 MHz	1 MHz to 100 MHz
Deviation	±10%; wider and narrower deviation optional to a full octave (limited to 300 MHz in VC-371 and 82 MHz in VC-373)		
Control Voltage	±5V (higher and lower sensitivity optional)		0 to +5V (±5V optional)
Linearity	±1%	±10% standard (±3% and ±1% optional with limited deviation)	±10%
Transfer Function	Positive	Negative	Positive for 0 to 5V Negative for ±5V
Accuracy (25°C)	±0.5% (tuning adjust optional, settable to ±0.1%)		N/A
Temperature Stability	**Standard:** 0/+50°C: ±1.5% Option **1:** −20/+70°C: ± 3% Option **2:** −55/+85°C: ± 6%	**Standard:** 0/+50°C: ±1% Option **1:** −20/+70°C: ±2% Option **2:** −55/+85°C: ±4% *Option **3:** 0/+50°C: ±0.3% *Option **4:** −20/+70°C: ±0.5% *Only for deviation ≤ ±10% Improved stability with oven	**Std:** 0/+50°C: ±2% ±1% Opt **1:** −20/+70°C: ±3% ±2% Opt **2:** −55/+85°C: ±5% ±4% Opt **3:** −55/+125°C: ±6% ±5% *unipolar control voltage **bipolar control voltage
Output Level	>1 Vrms into 1kΩ (TTL and CMOS optional)	>0.5 Vrms into 50Ω (TTL, CMOS, ECL optional)	TTL (HCMOS optional to 40 MHz)
Supply Voltage	15 Vdc ±5% (12-28 Vdc optional) +5 Vdc required for TTL, −5.2 Vdc required for ECL		5 Vdc ±5%
Size	2" x 2" x ¾" (51 x 51 x 19 mm), reduced height optional		0.5" x 0.8" x 0.2"
Configuration	Pins on base for pc board mounting Option "**W**": SMA, pins and mounting studs on base Option "**SW**": SMA on side, pins on base (size is 2" x 2¼" x ¾")		4 pin DIP (Surface mount and flatpack pkg's available)

Clock TCXOs

	TTL		CMOS
			
	Lowest price	*Smallest size; DIP pin configuration*	
Frequency	12 kHz-20 MHz	32 kHz-20 MHz	300 Hz-15 MHz
Temperature Stability			
(Temp. Range **A**) +15°C to +35°C:	**CO-231A57:** ±5 x 10^{-7}	**CO-532A57:** ±5 x 10^{-7}	**CO-236A57:** ±5 x 10^{-7}
(Temp. Range **B**) 0°C to +50°C:	**CO-231B16:** ±1 x 10^{-6}	**CO-532B16:** ±1 x 10^{-6}	**CO-236B16:** ±1 x 10^{-6}
(Temp. Range **C**) 0°C to +70°C:	**CO-231C36:** ±3 x 10^{-6}	**CO-532C36:** ±3 x 10^{-6}	**CO-236C36:** ±3 x 10^{-6}
(Temp. Range **D**) −20°C to +70°C:	**CO-231D56:** ±5 x 10^{-6}	**CO-532D56:** ±5 x 10^{-6}	**CO-236D56:** ±5 x 10^{-6}
(Temp. Range **E**) −40°C to +75°C:	**CO-231E15:** ±1 x 10^{-5}	**CO-532E15:** ±1 x 10^{-5}	**CO-236E15:** ±1 x 10^{-5}
(Temp. Range **F**) −55°C to +85°C:	**CO-231F25:** ±2 x 10^{-5}	**CO-532F25:** ±2 x 10^{-5}	**CO-236F25:** ±2 x 10^{-5}
Aging Rate	1 x 10^{-6} per year		
Output	TTL compatible (drives 10 TTL loads)		CMOS compatible
Supply	+5 Vdc ±5%		+12 Vdc ±5% (9-15 Vdc optional)
Current	4-20 MHz: <30 mA <4 MHz: 40-80 mA	8-20 MHz: <30 mA <8 MHz: 40-80 mA	3-10 mA depending upon frequency
Frequency Adjustment	settable to 1 x 10^{-6}		
Size	1½" x 1½" x ½" (38 x 38 x 13 mm) pcb mount housed in metal can with epoxy base	1" x 1" x 0.38" (26 x 26 x 10 mm) DIP compatible pin configuration metal can with metalized base	1½" x 1½" x ½" (38 x 38 x 13 mm) pcb mount housed in metal can with epoxy base

Custom Products

Vectron offers the broadest available line of standard product crystal oscillators. With these products as a base, Vectron has produced special crystal oscillators in virtually every conceivable package, some of which are pictured below. Further, Vectron has engineered and produced a variety of crystal oscillator based sub-systems; photos of some of these are also shown below. We welcome the opportunity to design and construct custom crystal oscillator related products for your specific needs.



VCXOs Voltage Controlled Crystal Oscillators

for Phase Locking Applications

	TTL			HCMOS	ACMOS	ECL		SINEWAVE			
Configuration	PC board mount	low profile hybrid DIP		low profile hybrid DIP	low profile hybrid DIP	low profile hybrid DIP		PC board mount		rf output connector	low profile hybrid DIP
						Std. ECL	100K ECL				
Series	(a) **CO-231V** (b) **CO-231VH**	**CO-401V** **CO-402V**	**CO-404V**	**CO-441V** **CO-442V**	**CO-444V**	**CO-434V**	**CO-454V**	(a) **CO-233V** (b) **CO-233VH**	(a) **CO-233VF** (b) **CO-286VP**	(a) **CO-233VFW** (b) **CO-286VW**	(a) **CO-484V** (b) **CO-487V**
Center Frequency	(a) 32 kHz-25 MHz (b) 25.1-70 MHz	32 kHz-52 MHz	52.1-70 MHz	64 kHz-52 MHz	52.1 MHz-70 MHz	8-200 MHz	8-200 MHz	(a) 8-149.9 MHz (b) 150-200 MHz	(a) 8-400 MHz (b) 400.1-1200 MHz	(a) 8-400 MHz (b) 400.1-1200 MHz	8-200 MHz
Supply Voltage (±5%)	+5 Vdc			+5 Vdc	+5 Vdc	−5.2 Vdc	−4.5/−5.2 Vdc	+15 Vdc (+12 Vdc to +24 Vdc optional)			

NEW! NEW! NEW!

Deviation/ Stability Alternatives

Code	Temperature Range	Temperature Stability	Minimum Deviation
0	0/+50°C	±10 ppm	± 30 ppm
A	0/+50°C	±20 ppm	± 50 ppm
B	0/+50°C	±35 ppm	±100 ppm
C*	0/+50°C	±35 ppm	±200 ppm
D	0/+70°C	±20 ppm	± 40 ppm
E	0/+70°C	±40 ppm	±100 ppm
F*	0/+70°C	±40 ppm	±200 ppm
G	−20/+70°C	±30 ppm	± 60 ppm
H	−20/+70°C	±40 ppm	±100 ppm
I*	−20/+70°C	±40 ppm	±200 ppm
J	−40/+85°C	±40 ppm	± 60 ppm
K	−40/+85°C	±50 ppm	±100 ppm
L*	−40/+85°C	±50 ppm	±200 ppm
M	−55/+85°C	±50 ppm	±100 ppm
N*	−55/+85°C	±50 ppm	±200 ppm

NOTE: Surface Mount and Flatpack Packages are available for most models. Please contact factory for assistance.

*The following notes apply to options C, F, I, L and N (±200 ppm deviation)
- They are only available at frequencies up to 25 MHz (75 MHz for ECL & Sinewave Models)
- Linearity of ±10% is standard
- Model CO-231V which is normally packaged in a 1.5" x 1.5" x 0.5" metal can with epoxy base, requires a metal base which increases height to 5/8"; pin diameter is then .030".

Control Voltage	0 to 5V; positive transfer function (lowest frequency at 0V)			0 to 5V; positive transfer function (lowest frequency at 0V)		0 to −5V (lowest frequency at 0V) *±3V to ±10V optional *(With bipolar control voltage option, transfer function is negative, linearity is ±10%, and an additional +12V to +24V supply is required for ECL models)		0 to +6V positive transfer function (lowest frequency at 0V) *±3V to ±10V optional except for CO-286V			
Linearity	±20% (±10% optional); ±10% is standard with bipolar control voltage and with deviation/stability options C, F, I, L and N										
Mechanical Tuning Option	"T"	N/A	N/A	N/A	N/A	N/A		"T"	"T"	"T"	N/A
	"T" indicates that a mechanical tuning option is available; add "T" to model number					"T" indicates that a mechanical tuning option is available; add "T" to model number					
Size	(a) CO-231V 1½" x 1½" x ½" (b) CO-231VH 1⅜" x 1⅜" x ½"	0.5" x 0.8" x 0.2" CO-401V: 4 pin CO-402V: 14 pin	0.8" x 0.8" x 0.2" 14 pin double DIP	0.5" x 0.8" x 0.2" CO-441V: 4 pin CO-442V: 14 pin	0.8" x 0.8" x 0.2" 14 pin double DIP	0.8" x 0.98" x 0.2" 16 pin double DIP		1½" x 1½" x 5/8" CO-233V & VH differ in pin configuration	(a) 2" x 2" x ¾" (b) 1" x 2" x 0.6"	(a) 2" x 2" x ¾" (b) 1" x 2" x 0.6"	(a) 16 pin double DIP 0.8" x 0.98" x 0.2" (b) Flatpack 1.0" x 1.0" x 0.17"

Wide Deviation Linear VCXOs

Series	BASIC VCXOS		TEMPERATURE COMPENSATED (TC/VCXOS)		OVEN CONTROLLED (OC/VCXOs)	
	CO-271	CO-275, CO-275H	CO-351	CO-352	CO-272	CO-276
Center Frequency	to 23 MHz	23.1-600 MHz	to 20 MHz	20.1-500 MHz	to 23 MHz	23.1-500 MHz
Deviation	±.001% to ±.25%. Model Codes for ±.01%, ±.03%, ±.1%, and ±.25% are shown in the stability section below (for deviation exceeding ±0.25% consider a Vectron non-crystal VCO or custom VCXO).					
Control Voltage	±5 volts (higher or lower sensitivity, or unipolar control, available); Negative transfer function					
Linearity	"N": ±5% (smooth monotonic "A": ±3% characteristic with "B": ±1% no discontinuities)					

Stability (at f_0)	(Temperature Range B) 0°C to +50°C		(Temperature Range D) −20°C to +70°C		(Temperature Range F) −55°C to +85°C		(Temperature Range B) 0°C to +50°C		(Temperature Range D) −20°C to +70°C		(Temperature Range F) −55°C to +85°C		(Temperature Range B) 0°C to +50°C		(Temperature Range D) −20°C to +70°C		(Temperature Range F) −55°C to +85°C	
	Code	Stability	Code	Stability	Code	Stability	Code	Stability	Code	Stability	Code	Stability	Code	Stability	Code	Stability	Code	Stability
±.01% deviation (G)	**GB35** **GB15**	±.003% ±.001%	**GD55** **GD35**	±.005% ±.003%	**GF55**	±.005%	**GB36** **GB57**	±.0003% ±.00005%	**GD56** **GD16**	±.0005% ±.0001%	**GF25** **GF56**	±.002% ±.0005%	**GB37**	±.00003%	**GD57**	±.00005%	**GF16**	±.0001%
±.03% deviation (H)	**HB55** **HB25**	±.005% ±.002%	**HD14** **HD55**	±.01% ±.005%	**HF14**	±.01%	**HB15** **HB56**	±.001% ±.0005%	**HD15** **HD56**	±.001% ±.0005%	**HF55** **HF25**	±.005% ±.002%	**HB16**	±.0001%	**HD26**	±.0002%	**HF56**	±.0005%
±.1% deviation (L)	**LB14** **LB35**	±.01% ±.003%	**LD24** **LD14**	±.02% ±.01%	**LF34**	±.03%	**LB25** **LB15**	±.002% ±.001%	**LD55** **LD25**	±.005% ±.002%	**LF14** **LF55**	±.01% ±.005%	**LB36**	±.0003%	**LD56**	±.0005%	**LF15**	±.001%
NEW! ±.25% deviation (K)	**KB34** **KB14**	±.03% ±.01%	**KD54** **KD34**	±.05% ±.03%	**KF13**	±.1%	**KB14** **KB35**	±.01% ±.003%	**KD24** **KD14**	±.02% ±.01%	**KF34** **KF24**	±.03% ±.02%	—		—		—	

Output Level	Sinewave is standard (3.5-600 MHz); TTL optional (3.5-100 MHz), ECL optional (20-200 MHz); lower frequency sine/TTL, and CMOS/HCMOS available on special order.						
Supply Voltage	15 Vdc ±5% standard; 12-28 Vdc optional. +5 Vdc required for TTL; −5.2 Vdc required for ECL					24 Vdc standard; 12-28 Vdc optional. +5 Vdc required for TTL −5.2 Vdc required for ECL	
Frequency Adjust.	Screwdriver adjustment permits setting center frequency; range is approximately 10% of deviation, but no less than ±.001%						
Size	2" x 2" x ¾" (51 x 51 x 19 mm) 2" x 2¼" x ¾" for SW option	2" x 3" x ¾" (51 x 77 x 19 mm) (reduced size available)	2" x 2" x ¾" (51 x 51 x 19 mm) 2" x 2¼" x ¾" for SW option	2" x 3" x ¾" (51 x 77 x 19 mm)	2" x 2" x 4" (51 x 51 x 102 mm)	2" x 2" x 4" (51 x 51 x 102 mm)	
Configuration Options	pins for pc board mounting (rf output connector option recommended above 200 MHz) "W": SMA, pins, and mounting studs on base "SW": SMA on side, pins on base (studs optional on CO-271SW, Std on CO-275SW) (SMC connector available)		pins for pcb mount "W": SMA, pins and mounting studs on base "SW": SMA on side, pins on base (studs optional) (SMC connector available)	pins for pcb mount and studs (rf output connector option recommended above 200 MHz) "SW": SMA on side, pins and studs on base (SMC connector available)	octal plug-in, studs "W": SMA, solder header, studs "U": SMC, solder header, studs "X": BNC, solder header, studs	SMC, solder header, studs "W": SMA, solder header, studs "X": BNC, solder header, studs	

PLEASE QUOTE on _____ (quantity) of the following:

Standard product: Model _____ Freq. _____

Or the following: ☐ Clock ☐ TCXO ☐ OCXO ☐ VCXO ☐ VCO

Frequency _____
Output _____
Supply _____
Accuracy at 25°C (if no tuning) _____
Temp. Range _____
Temp. Stability _____
Aging _____
Size Restrictions _____
Connector(s) or P.C. mount _____
Environment _____
Other _____

VCXO or VCO:

Deviation _____
Control voltage _____
Linearity _____
Other _____

☐ Have a Sales Engineer contact me.

My requirement is: ☐ Immediate ☐ 3-6 months
☐ Information only ☐ For a proposal

☐ Send full catalog (covers same products as Short Form but in more depth).

Name _____

Title _____

Firm _____

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City _____

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The Crystal Oscillator Company

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PO BOX 5160

NORWALK CT 06856-9979

PLEASE QUOTE on _____ (quantity) of the following:

Standard product: Model _____ Freq. _____

Or the following: ☐ Clock ☐ TCXO ☐ OCXO ☐ VCXO ☐ VCO

Frequency _____
Output _____
Supply _____
Accuracy at 25°C (if no tuning) _____
Temp. Range _____
Temp. Stability _____
Aging _____
Size Restrictions _____
Connector(s) or P.C. mount _____
Environment _____
Other _____

VCXO or VCO:

Deviation _____
Control voltage _____
Linearity _____
Other _____

☐ Have a Sales Engineer contact me.

My requirement is: ☐ Immediate ☐ 3-6 months
☐ Information only ☐ For a proposal

☐ Send full catalog (covers same products as Short Form but in more depth).

Name _____

Title _____

Firm _____

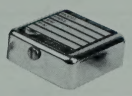
Street _____

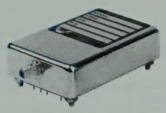
City _____

State _____ Zip _____

Phone _____

Basic TCXOs





	50 Hz to 20 MHz		20.1 MHz to 140 MHz	140 MHz to 420 MHz	420 MHz to 630 MHz	630 MHz to 1 GHz
	CO-251 SERIES Moderate Stability	**CO-252 SERIES** High Stability	**CO-254 SERIES**	**CO-255 SERIES**	**CO-256 SERIES**	**CO-856 SERIES**
Temperature Stability (Temp. Range **A**) +15°C to +35°C	**CO-251A57:** ±5 x 10^{-7} **CO-251A27:** ±2 x 10^{-7}	**CO-252A17:** ±1 x 10^{-7} **CO-252A58:** ±5 x 10^{-8}	**CO-254A57:** ±5 x 10^{-7} **CO-254A17:** ±1 x 10^{-7}	**CO-255A57:** ±5 x 10^{-7} **CO-255A17:** ±1 x 10^{-7}	**CO-256A57:** ±5 x 10^{-7} **CO-256A17:** ±1 x 10^{-7}	**CO-856A57:** ±5 x 10^{-7} **CO-856A17:** ±1 x 10^{-7}
(Temp. Range **B**) 0°C to +50°C	**CO-251B16:** ±1 x 10^{-6}	**CO-252B57:** ±5 x 10^{-7} **CO-252B27:** ±2 x 10^{-7} **CO-252B17:** ±1 x 10^{-7}	**CO-254B16:** ±1 x 10^{-6} **CO-254B57:** ±5 x 10^{-7} **CO-254B27:** ±2 x 10^{-7}	**CO-255B16:** ±1 x 10^{-6} **CO-255B57:** ±5 x 10^{-7} **CO-255B27:** ±2 x 10^{-7}	**CO-256B16:** ±1 x 10^{-6} **CO-256B57:** ±5 x 10^{-7} **CO-256B27:** ±2 x 10^{-7}	**CO-856B16:** ±1 x 10^{-6} **CO-856B57:** ±5 x 10^{-7}
(Temp. Range **C**) 0°C to +70°C	**CO-251C36:** ±3 x 10^{-6}	**CO-252C16:** ±1 x 10^{-6} **CO-252C57:** ±5 x 10^{-7} **CO-252C37:** ±3 x 10^{-7}	**CO-254C36:** ±3 x 10^{-6} **CO-254C16:** ±1 x 10^{-6} **CO-254C37:** ±3 x 10^{-7}	**CO-255C36:** ±3 x 10^{-6} **CO-255C16:** ±1 x 10^{-6} **CO-255C37:** ±3 x 10^{-7}	**CO-256C36:** ±3 x 10^{-6} **CO-256C16:** ±1 x 10^{-6} **CO-256C37:** ±3 x 10^{-7}	**CO-856C36:** ±3 x 10^{-6} **CO-856C16:** ±1 x 10^{-6}
(Temp. Range **D**) −20°C to +70°C	**CO-251D56:** ±5 x 10^{-6}	**CO-252D16:** ±1 x 10^{-6} **CO-252D57:** ±5 x 10^{-7}	**CO-254D56:** ±5 x 10^{-6} **CO-254D16:** ±1 x 10^{-6} **CO-254D57:** ±5 x 10^{-7}	**CO-255D56:** ±5 x 10^{-6} **CO-255D16:** ±1 x 10^{-6} **CO-255D57:** ±5 x 10^{-7}	**CO-256D56:** ±5 x 10^{-6} **CO-256D16:** ±1 x 10^{-6} **CO-256D57:** ±5 x 10^{-7}	**CO-856D56:** ±5 x 10^{-6} **CO-856D16:** ±1 x 10^{-6}
(Temp. Range **E**) −40°C to +75°C	**CO-251E15:** ±1 x 10^{-5}	**CO-252E56:** ±5 x 10^{-6} **CO-252E26:** ±2 x 10^{-6} **CO-252E16:** ±1 x 10^{-6}	**CO-254E56:** ±5 x 10^{-6} **CO-254E26:** ±2 x 10^{-6} **CO-254E16:** ±1 x 10^{-6}	**CO-255E56:** ±5 x 10^{-6} **CO-255E26:** ±2 x 10^{-6} **CO-255E16:** ±1 x 10^{-6}	**CO-256E56:** ±5 x 10^{-6} **CO-256E26:** ±2 x 10^{-6} **CO-256E16:** ±1 x 10^{-6}	**CO-856E56:** ±5 x 10^{-6} **CO-856E26:** ±2 x 10^{-6}
(Temp. Range **F**) −55°C to +85°C	**CO-251F25:** ±2 x 10^{-5}	**CO-252F56:** ±5 x 10^{-6} **CO-252F26:** ±2 x 10^{-6} **CO-252F16:** ±1 x 10^{-6}	**CO-254F56:** ±5 x 10^{-6} **CO-254F26:** ±2 x 10^{-6} **CO-254F16:** ±1 x 10^{-6}	**CO-255F56:** ±5 x 10^{-6} **CO-255F26:** ±2 x 10^{-6} **CO-255F16:** ±1 x 10^{-6}	**CO-256F56:** ±5 x 10^{-6} **CO-256F26:** ±2 x 10^{-6} **CO-256F16:** ±1 x 10^{-6}	**CO-856F56:** ±5 x 10^{-6}
(Temp. Range **G**) −55°C to +105°C		**CO-252G56:** ±5 x 10^{-6}	**CO-254G56:** ±5 x 10^{-6}	**CO-255G56:** ±5 x 10^{-6}	**CO-256G56:** ±5 x 10^{-6}	
(Temp. Range **H**) −55°C to +125°C		**CO-252H15:** ±1 x 10^{-5}	**CO-254H15:** ±1 x 10^{-5}	**CO-255H15:** ±1 x 10^{-5}	**CO-256H15:** ±1 x 10^{-5}	
Output Level & Frequency	TTL: 50 Hz -20 MHz CMOS: 50 Hz -15 MHz Sine: 1 MHz-20 MHz HCMOS: 40 kHz-20 MHz (CO-252)		Sine: 20 MHz-140 MHz TTL: 20 MHz-100 MHz ECL: 20 MHz-140 MHz HCMOS: 20 MHz- 50 MHz	Sine: 140 MHz-420 MHz ECL: 140 MHz-280 MHz	Sine: 420 MHz-630 MHz	Sine: 630 MHz-1 GHz
Supply	Any supply voltage in 5-24 Vdc range; current as low as 3 mA for some models			Any supply voltage in 12-24 Vdc range		
Frequency Adjustment	Screwdriver adjustment, settable to 1 x 10^{-7}. Electronic tuning (TC/VCXO) capability optional.					
Aging Rate	5 x 10^{-7} to 1 x 10^{-6} per year		1 x 10^{-6}/year	1 x 10^{-6}/year		
Size	2" x 2" x ¾" (51 x 51 x 19 mm) ½" height and smaller size available			2" x 3" x ¾" (51 x 76 x 19 mm)	2" x 4" x ¾" (51 x 102 x 19 mm)	1.75" x 3.75" x 0.75" (45 x 95 x 19 mm)

Size Reduced TCXOs

	Hybrid Design		Other small TCXOs	
	CO-258 *Lowest profile* *0.32" (8.2 mm) height*	**CO-259** *0.4" (10.2 mm) height* *with mechanical tuning*	**CO-257** *Least expensive type among* *Vectron's size reduced Series*	**CO-253** *24 pin DIP* *resistance welded package*
Output level & Frequency	TTL: 20 kHz to 70 MHz HCMOS 40 kHz to 50 MHz CMOS: 400 Hz to 15 MHz ECL: 5 Mhz to 70 MHz		*TTL/HCMOS: 315 kHz to 50 MHz +7 dBm sine: 5 MHz to 140 MHz	*TTL/HCMOS: 315 kHz to 50 MHz sine: 5 MHz to 140 MHz *Drives 3 TTL loads, 10 LSTTL loads or HCMOS (output from HCMOS gate).
Temperature Stability (Temp. Range **A**) +15°C to +35°C	**CO-258A37:** ±3 x 10^{-7} **CO-258A17:** ±1 x 10^{-7}	**CO-259A37:** ±3 x 10^{-7} **CO-259A17:** ±1 x 10^{-7}	**CO-257A37:** ±3 x 10^{-7} **CO-257A17:** ±1 x 10^{-7}	**CO-253A37:** ±3 x 10^{-7} **CO-253A17:** ±1 x 10^{-7}
(Temp. Range **B**) 0°C to +50°C	**CO-258B57:** ±5 x 10^{-7} **CO-258B27:** ±2 x 10^{-7}	**CO-259B57:** ±5 x 10^{-7} **CO-259B27:** ±2 x 10^{-7}	**CO-257B57:** ±5 x 10^{-7} **CO-257B27:** ±2 x 10^{-7}	**CO-253B57:** ±5 x 10^{-7} **CO-253B27:** ±2 x 10^{-7}
(Temp. Range **C**) 0°C to +70°C	**CO-258C57:** ±5 x 10^{-7} **CO-258C37:** ±3 x 10^{-7}	**CO-259C57:** ±5 x 10^{-7} **CO-259C37:** ±3 x 10^{-7}	**CO-257C57:** ±5 x 10^{-7} **CO-257C37:** ±3 x 10^{-7}	**CO-253C57:** ±5 x 10^{-7} **CO-253C37:** ±3 x 10^{-7}
(Temp. Range **D**) −20°C to +70°C	**CO-258D36:** ±3 x 10^{-6} **CO-258D16:** ±1 x 10^{-6} ***CO-258D57:** ±5 x 10^{-7}	**CO-259D36:** ±3 x 10^{-6} **CO-259D16:** ±1 x 10^{-6} ***CO-259D57:** ±5 x 10^{-7}	**CO-257D36:** ±3 x 10^{-6} **CO-257D16:** ±1 x 10^{-6} ***CO-257D57:** ±5 x 10^{-7}	**CO-253D36:** ±3 x 10^{-6} **CO-253D16:** ±1 x 10^{-6} ***CO-253D57:** ±5 x 10^{-7}
(Temp. Range **E**) −40°C to +75°C	**CO-258E56:** ±5 x 10^{-6} **CO-258E26:** ±2 x 10^{-6} **CO-258E16:** ±1 x 10^{-6}	**CO-259E56:** ±5 x 10^{-6} **CO-259E26:** ±2 x 10^{-6} **CO-259E16:** ±1 x 10^{-6}	**CO-257E56:** ±5 x 10^{-6} **CO-257E26:** ±2 x 10^{-6} **CO-257E16:** ±1 x 10^{-6}	**CO-253E56:** ±5 x 10^{-6} **CO-253E26:** ±2 x 10^{-6} **CO-253E16:** ±1 x 10^{-6}
(Temp. Range **F**) −55°C to +85°C	**CO-258F56:** ±5 x 10^{-6} **CO-258F26:** ±2 x 10^{-6} ***CO-258F16:** ±1 x 10^{-6}	**CO-259F56:** ±5 x 10^{-6} **CO-259F26:** ±2 x 10^{-6} ***CO-259F16:** ±1 x 10^{-6}	**CO-257F56:** ±5 x 10^{-6} **CO-257F26:** ±2 x 10^{-6} ***CO-257F16:** ±1 x 10^{-6}	**CO-253F56:** ±5 x 10^{-6} **CO-253F26:** ±2 x 10^{-6} ***CO-253F16:** ±1 x 10^{-6}
(Temp. Range **G**) −55°C to +105°C	**CO-258G56:** ±5 x 10^{-6} ***CO-258G36:** ±3 x 10^{-6}	**CO-259G56:** ±5 x 10^{-6} ***CO-259G36:** ±3 x 10^{-6}	**CO-257G56:** ±5 x 10^{-6} ***CO-257G36:** ±3 x 10^{-6}	**CO-253G56:** ±5 x 10^{-6} ***CO-253G36:** ±3 x 10^{-6}
(Temp. Range **H**) −55°C to +125°C	**CO-258H15:** ±1 x 10^{-5} *Asterisked models not available above 12 MHz	**CO-259H15:** ±1 x 10^{-5}	**CO-257H15:** ±1 x 10^{-5} *Asterisked model not available above 12 MHz	**CO-253H15:** ±1 x 10^{-5}
Aging Rate	1 x 10^{-6} per year	1 x 10^{-6} per year	1 x 10^{-6} per year	1 x 10^{-6} per year
Supply Voltage	TTL & HCMOS: 10-15V and 5V (single 5V optional in CO-259) CMOS: 10-15V; ECL: 10-15V and −5.2V		5V for TTL/HCMOS 12-15V for sine	10-24V and 5V single 5V supply optional
Frequency Adjustment	Voltage control	Mechanical (VCXO opt.)	Mechanical (VCXO opt.)	external potentiometer
Size	1.5" x 1.5" x 0.32" (38 x 38 x 8.2 mm)	1.5" x 2.0" x 0.4" (38 x 51 x 10.2 mm)	1.5" x 1.5" x 0.5" (38 x 38 x 12.7 mm)	0.8" x 1.4" x 0.39" (21 x 36 x 9.9 mm)

High Frequency OCXOs

Oven Controlled Crystal Oscillators

(<1 MHz to 25 MHz)

Basic OCXOs

Low Phase Noise Option

HIGH STABILITY (to 5 x 10^{-10}/day) — ULTRA-STABLE (to 1 x 10^{-10}/day)

	Most economical CO-211 SERIES	Higher stability and output CO-200 SERIES	Superior temperature stability CO-244 SERIES	CO-206 SERIES	Size reduced; best stability CO-706 SERIES
Frequency	<1 MHz to 25 MHz with 1, 2, 4, 5 and 10 MHz standard			5 MHz standard (other frequencies available to 75 MHz)	
Temperature Stability (Temp. Range A) + 15/+ 35 °C	CO-21 ☐ A ☐: ±3 x 10^{-8} ±2 x 10^{-8} CO-21 ☐ A ☐: ±5 x 10^{-8} ±3 x 10^{-8}	CO-20 ☐ A ☐: ±3 x 10^{-9} ±3 x 10^{-9} CO-20 ☐ A ☐: ±1 x 10^{-8} ±5 x 10^{-10}	CO-24 ☐ A ☐: ±5 x 10^{-10} ±3 x 10^{-10}	CO-20 ☐ A39-V: ±3 x 10^{-9} CO-20 ☐ A510-V: ±5 x 10^{-10}	CO-70 ☐ A19-V: ±1 x 10^{-9} CO-70 ☐ A310-V: ±3 x 10^{-10}
(Temp. Range B) 0/+ 50 °C	CO-21 ☐ B ☐: ±5 x 10^{-8} ±3 x 10^{-8} CO-21 ☐ B ☐: ±1 x 10^{-8} ±5 x 10^{-10}	CO-20 ☐ B ☐: ±5 x 10^{-9} ±5 x 10^{-9} CO-20 ☐ B ☐: ±3 x 10^{-9} ±2 x 10^{-9}	CO-24 ☐ B ☐: ±1 x 10^{-8} ±5 x 10^{-10}	CO-20 ☐ B59-V: ±5 x 10^{-9} CO-20 ☐ B19-V: ±1 x 10^{-9}	CO-70 ☐ B29-V: ±2 x 10^{-9} CO-70 ☐ B510-V: ±5 x 10^{-10}
(Temp. Range D) − 20/+ 70 °C	CO-21 ☐ D ☐: ±1 x 10^{-7} ±5 x 10^{-8} CO-21 ☐ D ☐: ±3 x 10^{-8} ±1 x 10^{-8}	CO-20 ☐ D ☐: ±1 x 10^{-8} ±1 x 10^{-8} CO-20 ☐ D ☐: ±5 x 10^{-9} ±3 x 10^{-9}	CO-24 ☐ D ☐: ±3 x 10^{-8} ±2 x 10^{-8}	CO-20 ☐ D18-V: ±1 x 10^{-8} CO-20 ☐ D39-V: ±3 x 10^{-9}	CO-70 ☐ D59-V: ±5 x 10^{-9} CO-70 ☐ D29-V: ±2 x 10^{-9}
(Temp. Range G) − 55/+ 75 °C	CO-21 ☐ G ☐: ±2 x 10^{-7} ±1 x 10^{-7} CO-21 ☐ G ☐: ±5 x 10^{-8} ±3 x 10^{-8}	CO-20 ☐ G ☐: ±3 x 10^{-8} ±3 x 10^{-8} CO-20 ☐ G ☐: — ±2 x 10^{-8}	CO-24 ☐ G ☐: ±1 x 10^{-8} ±5 x 10^{-9}	CO-20 ☐ G38-V: ±3 x 10^{-8} CO-20 ☐ G18-V: ±1 x 10^{-8}	CO-70 ☐ G28-V: ±2 x 10^{-8} CO-70 ☐ G59-V: ±5 x 10^{-9}
Aging	**4:** 1 x 10^{-9}/day **5:** 5 x 10^{-9}/day **6:** 3 x 10^{-9}/day **7:** 1 x 10^{-9}/day ***8S:** 5 x 10^{-10}/day Temp. stability e.g. 38 = ±3 x 10^{-8} 59 = ±5 x 10^{-9}	**1:** 1 x 10^{-8}/day **2:** 5 x 10^{-9}/day **3:** 3 x 10^{-9}/day **4:** 1 x 10^{-9}/day ***5S:** 5 x 10^{-10}/day Temp. stability e.g. 19 = ±1 x 10^{-9} 510 = ±5 x 10^{-10}	**4:** 1 x 10^{-9}/day ***5S:** 5 x 10^{-10}/day Temp. stability e.g. 39 = ±3 x 10^{-9} 310 = ±3 x 10^{-10}	**5:** 3 x 10^{-10}/day 4 x 10^{-8}/year ***7:** 1 x 10^{-10}/day 2 x 10^{-8}/year	**6:** 3 x 10^{-10}/day 4 x 10^{-8}/year ***7:** 1 x 10^{-10}/day 2 x 10^{-8}/year
	*8S and 5S types use SC cut crystals for 5 x 10^{-10}/day, 1 x 10^{-7}/year aging (5 x 10^{-8}/year optional at some frequencies). When using this aging option, also use the "SC" column temperature stabilities.			*1 x 10^{-10}/day models available in 4-6.25 MHz range and multiples of 4-6.25 MHz.	
Output Level	Standard: >1 Vrms into 500Ω Optional: 0 dBm or +7 dBm/50Ω TTL or HCMOS	Standard: >1 Vrms into 50Ω Optional: TTL, HCMOS, or ECL	Standard: >1 Vrms into 500Ω Optional: 0 dBm to +13 dBm/50Ω TTL, HCMOS or ECL	Standard: >1 Vrms/50Ω Optional: TTL, HCMOS	Standard: >0.5 Vrms/50Ω Optional: +13 dBm/50Ω TTL, HCMOS
Supply Voltage (±5%)	24 Vdc standard (Operation from any voltage in 5-28 Vdc range optional on most models).			24 Vdc standard (Operation from any voltage in 15-28 Vdc range optional)	15 Vdc standard
Input Power	<6 watts at turn-on (− 20/+ 70°C); <3 watts stabilized (25°C) reduced power drain available			<6 watts at turn-on (− 20/+ 70°C) <3 watts stabilized (25°C)	
Frequency Adjustment	Screwdriver adjustment settable to 1 x 10^{-8} nominal. Electronic tuning (VCXO) option "**V**"			Screwdriver adjustment and electronic tuning	
Size	2" x 2" x 3" (51 x 51 x 76 mm)	2" x 2" x 4" (51 x 51 x 102 mm)	2¼" x 2¼" x 4¼" (57 x 57 x 110 mm)	2¼" x 2¼" x 4¼" (57 x 57 x 110 mm)	2" x 2" x 2¾" (3¼" above 12.5 MHz)
Base	Octal plug, solder header or rf connector with solder header			Same options as CO-244	Solder header, SMA optional

Phase noise (typical) with sine output in 4-12 MHz range for "High Stability" Series and in 4-6 MHz range for "Ultra-Stable" Series

Offset from Carrier	Standard	Low Noise Option **L1**	*Ultra Low Noise Option **L2**
100 Hz	− 130 dBc/Hz	− 135 dBc/Hz	− 145 dBc/Hz
1 kHz	− 140 dBc/Hz	− 145 dBc/Hz	− 160 dBc/Hz
10 kHz	− 143 dBc/Hz	− 148 dBc/Hz	− 165 dBc/Hz
50 kHz	− 145 dBc/Hz	− 150 dBc/Hz	− 165 dBc/Hz

(Figures shown are with AT crystals. Phase noise is somewhat improved with SC crystals.)
*Output level with L2 option is +10 dBm minimum for all models; SMA output connector is standard.

Offset from Carrier	Standard	*Ultra Low Noise Option **L2**
10 Hz	− 115 dBc/Hz	− 135 dBc/Hz
100 Hz	− 140 dBc/Hz	− 155 dBc/Hz
1 kHz	− 145 dBc/Hz	− 165 dBc/Hz
10 kHz	− 148 dBc/Hz	− 168 dBc/Hz
50 kHz	− 150 dBc/Hz	− 168 dBc/Hz

*L2 option restricted to +10 dBm output.

Size Reduced OCXOs

Low Phase Noise Option

Low Profile PC Board Mount OCXOs

Premium Performance Miniature OCXOs

	CO-711 SERIES (*AT Cut Crystal*)	CO-718S SERIES (*SC/IT Cut Crystal*)	CO-700 SERIES (*AT Cut Crystal*)	CO-705S SERIES (*SC/IT Cut Crystal*)
Frequency	4-25 MHz with 5 MHz and 10 MHz standard (available to 65 kHz with logic output)			
Temperature Stability (Temp. Range A) + 15°C to + 35°C	CO-71 ☐ **A38:** ±3 x 10^{-8} CO-71 ☐ **A59:** ±5 x 10^{-9}	CO-718SA28: ±2 x 10^{-8} CO-718SA39: ±3 x 10^{-9}	CO-70 ☐ **A59:** ±5 x 10^{-9} CO-70 ☐ **A19:** ±1 x 10^{-9}	CO-705SA39: ±3 x 10^{-9} CO-705SA510: ±5 x 10^{-10}
(Temp. Range B) 0°C to + 50°C	CO-71 ☐ **B58:** ±5 x 10^{-8} CO-71 ☐ **B18:** ±1 x 10^{-8}	CO-718SB38: ±3 x 10^{-8} CO-718SB59: ±5 x 10^{-9}	CO-70 ☐ **B18:** ±1 x 10^{-8} CO-70 ☐ **B29:** ±2 x 10^{-9}	CO-705SB59: ±5 x 10^{-9} CO-705SB19: ±1 x 10^{-9}
(Temp. Range D) − 20°C to + 70°C	CO-71 ☐ **D17:** ±1 x 10^{-7} CO-71 ☐ **D38:** ±3 x 10^{-8}	CO-718SD58: ±5 x 10^{-8} CO-718SD18: ±1 x 10^{-8}	CO-70 ☐ **D38:** ±3 x 10^{-8} CO-70 ☐ **D59:** ±5 x 10^{-9}	CO-705SD18: ±1 x 10^{-8} CO-705SD39: ±3 x 10^{-9}
(Temp. Range G) − 55°C to + 75°C	*CO-71 ☐ **G27:** ±2 x 10^{-7} *CO-71 ☐ **G58:** ±5 x 10^{-8}	CO-718SG17: ±1 x 10^{-7} *CO-718SG38: ±3 x 10^{-8}	CO-70 ☐ **G58:** ±5 x 10^{-8} CO-70 ☐ **G18:** ±1 x 10^{-8}	CO-705SG28: ±2 x 10^{-8} CO-705SG59: ±5 x 10^{-9}
(Temp. Range F) − 55°C to + 85°C		*CO-718SF27: ±2 x 10^{-7} *CO-718SF58: ±5 x 10^{-8}		CO-705SF38: ±3 x 10^{-8} CO-705SF18: ±1 x 10^{-8}
Aging	**4:** 1 x 10^{-8}/day (2 x 10^{-6}/year) **5:** 5 x 10^{-9}/day (1.5 x 10^{-6}/year) **6:** 3 x 10^{-9}/day (1 x 10^{-6}/year) **7:** 1 x 10^{-9}/day (3 x 10^{-7}/year)	5 x 10^{-10}/day (1 x 10^{-7}/year) (5 x 10^{-8}/year optional at some frequencies)	**1:** 1 x 10^{-8}/day (2 x 10^{-6}/year) **2:** 5 x 10^{-9}/day (1.5 x 10^{-6}/year) **3:** 3 x 10^{-9}/day (1 x 10^{-6}/year) **4:** 1 x 10^{-9}/day (3 x 10^{-7}/year)	5 x 10^{-10}/day (1 x 10^{-7}/year) (5 x 10^{-8}/year optional at some frequencies)
Restablization at 25°C (freq. relative to that 2 hrs. after turn-on, following 24 hrs. off)	1 x 10^{-7}: 9 minutes 3 x 10^{-8}: 12 minutes 1 x 10^{-8}: 30 minutes	Standard / 6W Turn-on 1 x 10^{-7}: 7 minutes / 4 minutes 3 x 10^{-8}: 10 minutes / 7 minutes 1 x 10^{-8}: 15 minutes / 10 minutes	1 x 10^{-7}: 10 minutes 3 x 10^{-8}: 15 minutes 1 x 10^{-8}: 30 minutes	Standard / 15W Turn-on 1 x 10^{-7}: 9 minutes / 3 minutes 3 x 10^{-8}: 12 minutes / 4 minutes 1 x 10^{-8}: 15 minutes / 5 minutes
Output Level	>0.5 Vrms/50Ω (+7 dBm); >1 Vrms/50Ω (+13 dBm) with L2 option HCMOS/TTL optional		>1 Vrms/50Ω (+13 dBm) HCMOS/TTL optional	
Supply Voltage (±5%)	+15 Vdc standard (12-24 Vdc optional); +5 Vdc supply with HCMOS/TTL output available except in CO-718S series.			
Input Power	<3.5 Watts at turn-on; <1.7 Watts stabilized at 25°C		<5 Watts at turn-on; <2 Watts stabilized at 25°C	
Frequency Adjustment	Screwdriver adjustment settable to 1 x 10^{-8}. Option "**V**": Voltage tuning			
Size	2" x 2" x 1" (¾" also available), pins for pcb mounting.		1.5" x 1.5" x 2", solder header and studs; SMA output optional	

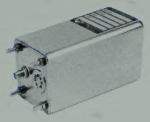
Phase Noise (with sinewave output 4-12 MHz)

Offset	Standard	Option **L2**	Offset	Standard	Option **L2**	Offset	Standard	Option **L2**	Offset	Standard	Option **L2**
10 Hz	− 105 dBc/Hz	− 120 dBc/Hz	10 Hz	− 115 dBc/Hz	− 130 dBc/Hz	10 Hz	− 105 dBc/Hz	− 120 dBc/Hz	10 Hz	− 115 dBc/Hz	− 130 dBc/Hz
100 Hz	− 135 dBc/Hz	− 145 dBc/Hz	100 Hz	− 140 dBc/Hz	− 155 dBc/Hz	100 Hz	− 135 dBc/Hz	− 145 dBc/Hz	100 Hz	− 140 dBc/Hz	− 155 dBc/Hz
1 kHz	− 145 dBc/Hz	− 160 dBc/Hz	1 kHz	− 145 dBc/Hz	− 163 dBc/Hz	1 kHz	− 145 dBc/Hz	− 160 dBc/Hz	1 kHz	− 145 dBc/Hz	− 163 dBc/Hz
10 kHz	− 148 dBc/Hz	− 165 dBc/Hz	10 kHz	− 148 dBc/Hz	− 166 dBc/Hz	10 kHz	− 148 dBc/Hz	− 165 dBc/Hz	10 kHz	− 148 dBc/Hz	− 166 dBc/Hz
50 kHz	− 150 dBc/Hz	− 165 dBc/Hz	50 kHz	− 150 dBc/Hz	− 168 dBc/Hz	50 kHz	− 150 dBc/Hz	− 165 dBc/Hz	50 kHz	− 150 dBc/Hz	− 168 dBc/Hz

To order Vectron Crystal Oscillators or for Engineering Assistance…call (203) 853-4433

VHF OCXOs Oven Controlled Crystal Oscillators (25-400 MHz)

Basic Series



*** Low Phase Noise Option**

	Most Economical **CO-229 SERIES**	*Highest Frequency, Lowest Noise* **CO-224 SERIES**	*Highest Stability* **CO-225 SERIES**	**CO-225S SERIES**
Frequency	25 MHz to 200 MHz	25 MHz to 400 MHz	25 MHz to 200 MHz	
Temperature Stability (Temp. Range **A**): +15°C to +35°C	**CO-229 A38:** ±3 x 10^{-8} **CO-229 A59:** ±5 x 10^{-9}	**CO-224 A38:** ±3 x 10^{-8} **CO-224 A59:** ±5 x 10^{-9}	**CO-225 A18:** ±1 x 10^{-8} **CO-225 A19:** ±1 x 10^{-9}	**CO-225SA18:** ±1 x 10^{-8} **CO-225SA19:** ±1 x 10^{-9}
(Temp. Range **B**): 0°C to +50°C	**CO-229 B58:** ±5 x 10^{-8} **CO-229 B18:** ±1 x 10^{-8}	**CO-224 B58:** ±5 x 10^{-8} **CO-224 B18:** ±1 x 10^{-8}	**CO-225 B58:** ±5 x 10^{-8} **CO-225 B18:** ±1 x 10^{-8} **CO-225 B39:** ±3 x 10^{-9}	**CO-225SB58:** ±5 x 10^{-8} **CO-225SB18:** ±1 x 10^{-8} **CO-225SB29:** ±2 x 10^{-9}
(Temp. Range **D**): −20°C to +70°C	**CO-229 D17:** ±1 x 10^{-7} **CO-229 D38:** ±3 x 10^{-8}	**CO-224 D17:** ±1 x 10^{-7} **CO-224 D38:** ±3 x 10^{-8}	**CO-225 D38:** ±3 x 10^{-8} **CO-225 D18:** ±1 x 10^{-8} **CO-225 D59:** ±5 x 10^{-9}	**CO-225SD38:** ±3 x 10^{-8} **CO-225SD18:** ±1 x 10^{-8} **CO-225SD39:** ±3 x 10^{-9}
(Temp. Range **G**): −55°C to +75°C	**CO-229 G27:** ±2 x 10^{-7} **CO-229 G58:** ±5 x 10^{-8}	**CO-224 G27:** ±2 x 10^{-7} **CO-224 G58:** ±5 x 10^{-8}	**CO-225 G17:** ±1 x 10^{-7} **CO-225 G38:** ±3 x 10^{-8}	**CO-225SG17:** ±1 x 10^{-7} **CO-225SG28:** ±2 x 10^{-8}
(Temp. Range **F**): −55°C to +35°C				**CO-225SF38:** ±3 x 10^{-8}
Aging	Standard: 1 x 10^{-8}/day, 2 x 10^{-6}/year Optional: 5 x 10^{-9}/day, 1 x 10^{-6}/year Option "**S**": 2 x 10^{-9}/day, 5 x 10^{-7}/year	Standard: 1 x 10^{-8}/day, 2 x 10^{-6}/year Optional: 5 x 10^{-9}/day, 1 x 10^{-6}/year Option "**S**": 2 x 10^{-9}/day, 5 x 10^{-7}/year	1 x 10^{-9}/day, 3 x 10^{-7}/year 1 x 10^{-10}/day to 75 MHz available in CO-207 and CO-707 series.	5 x 10^{-10}/day, 1 x 10^{-7}/year
Output Level	Standard: >0.5 Vrms into 50Ω (+7 dBm) Optional: TTL to 100 MHz	Standard: >1 Vrms into 50Ω (+13 dBm) Optional: ECL (to 200 MHz)	Standard: >0.5 Vrms into 50Ω (+7 dBm) Optional: +13 dBm ("**R**"), TTL, ECL	
Supply Voltage (±5%)	24 Vdc standard. Operation from any specified voltage in 12-28 Vdc range optional.			
Input Power	<6 watts at turn-on (−20/+70°C); <3 watts stabilized (25°C)			
Frequency Adjustment	Screwdriver adjust. settable to <1 x 10^{-8} nominal. Electronic tuning (VCXO) option "**V**".			
Size	2" x 2" x 3" (51 x 51 x 77 mm)	2" x 2" x 4" (51 x 51 x 102 mm)	2" x 2" x 4" (51 x 51 x 102 mm)	
Base	SMC output, solder header and 4 studs; SMA or BNC optional			
*** Phase noise** typical, with sine output in 75-125 MHz range	Offset from Carrier / Standard / Ultra-low noise option 100 Hz / −120 dBc/Hz 1 kHz / −135 dBc/Hz 10 kHz / −140 dBc/Hz 50 kHz / −145 dBc/Hz / not available	Offset from Carrier / Standard / *Ultra Low Noise Option **L2** 100 Hz / −120 dBc/Hz / −130 dBc/Hz 1 kHz / −135 dBc/Hz / −145 dBc/Hz 10 kHz / −140 dBc/Hz / −155 dBc/Hz 50 kHz / −145 dBc/Hz / −157 dBc/Hz *L2 option is restricted to +10 dBm (+7 dBm above 300 MHz)	Offset from Carrier / Standard / *Ultra Low Noise Option **L2** 100 Hz / −105 dBc/Hz / −120 dBc/Hz 1 kHz / −115 dBc/Hz / −135 dBc/Hz 10 kHz / −120 dBc/Hz / −140 dBc/Hz 50 kHz / −125 dBc/Hz / −140 dBc/Hz *L2 option is available to 125 MHz; contact factory for further improvement.	

Size Reduced VHF OCXOs (25-200 MHz)

*** Low Phase Noise Option**

	Lowest Noise **CO-724 SERIES** *(AT Cut Crystal)*	**CO-724S SERIES** *(SC/IT Cut Crystal)*	*Highest Stability* **CO-725 SERIES** *(AT Cut Crystal)*	**CO-725S SERIES** *(SC/IT Cut Crystal)*
Frequency	25-140 MHz range		25-200 MHz range	
Temperature Stability (Temp. Range **A**): +15°C to +35°C	**CO-724A38:** ±3 x 10^{-8} ***CO-724A18:** ±1 x 10^{-8}	**CO-724SA18:** ±1 x 10^{-8} ***CO-724SA39:** ±3 x 10^{-9}	**CO-725A38:** ±3 x 10^{-8} **CO-725A59:** ±5 x 10^{-9}	**CO-725SA18:** ±1 x 10^{-8} **CO-725SA39:** ±3 x 10^{-9}
(Temp. Range **B**): 0°C to +50°C	**CO-724B58:** ±5 x 10^{-8} ***CO-724B28:** ±2 x 10^{-8}	**CO-724SB28:** ±2 x 10^{-8} ***CO-724SB59:** ±5 x 10^{-9}	**CO-725B58:** ±5 x 10^{-8} ***CO-725B18:** ±1 x 10^{-8}	**CO-725SB28:** ±2 x 10^{-8} **CO-725SB59:** ±5 x 10^{-9}
(Temp. Range **D**): −20°C to +70°C	**CO-724D17:** ±1 x 10^{-7} ***CO-724D58:** ±5 x 10^{-8}	**CO-724SD58:** ±5 x 10^{-8} ***CO-724SD18:** ±1 x 10^{-8}	**CO-725D17:** ±1 x 10^{-7} **CO-725D38:** ±3 x 10^{-8}	**CO-725SD58:** ±5 x 10^{-8} **CO-725SD18:** ±1 x 10^{-8}
(Temp. Range **G**): −55°C to +75°C	**CO-724G37:** ±3 x 10^{-7} ***CO-724G17:** ±1 x 10^{-7}	**CO-724SG17:** ±1 x 10^{-7} ***CO-724SG38:** ±3 x 10^{-8}	***CO-725G37:** ±3 x 10^{-7} ***CO-725G58:** ±5 x 10^{-8}	**CO-725SG17:** ±1 x 10^{-7} ***CO-725SG38:** ±3 x 10^{-8}
(Temp. Range **F**): −55°C to +85°C	*Not available with L2 option	**CO-724SF27:** ±2 x 10^{-7} ***CO-724SF58:** ±5 x 10^{-8}	*Not available with L2 option	***CO-725SF27:** ±2 x 10^{-7} ***CO-725SF58:** ±5 x 10^{-8}
Aging	Standard: 1 x 10^{-8}/day (2 x 10^{-6}/year) Optional: 5 x 10^{-9}/day (1 x 10^{-6}/year)	2 x 10^{-9}/day (5 x 10^{-7}/year)	1 x 10^{-9}/day (3 x 10^{-7}/year) For 1 x 10^{-10}/day to 75 MHz, see CO-207 and CO-707 series	5 x 10^{-10}/day (1 x 10^{-7}/year)
Output Level	Standard: >0.5 Vrms/50Ω (+7 dBm); +10dBm optional Optional: HCMOS, TTL (to 70 MHz)		Standard: >0.5 Vrms/50Ω (+7 dBm) Optional: >1 Vrms/50Ω (+13 dBm) option "**R**" to 125 MHz	
Supply Voltage (±5%)	+15 Vdc standard. Operation from any specified voltage in 12-24 Vdc range optional.			
Input Power	<4 watts at turn-on (−20/+70°C); <1.8 watts stabilized 25°C.			
Frequency Adjustment	Multi-turn screwdriver adjust, settable to <1 x 10^{-8}. Electronic tuning option "**V**".			
Size	2" x 2" x 1" (51 x 51 x 25.4 mm). Reduced ht. available		2" x 2" x 1¼" (51 x 51 x 32 mm)	
Base	Pins for pcb mounting. Option "**W**" for SMA connector and terminals on side, studs on base.			
*** Phase noise** typical, with sine output in 75-125 MHz range	Offset from Carrier / Standard / Ultra Low Noise Option (**L2**) 100 Hz / −115 dBc/Hz / −130 dBc/Hz 1 kHz / −130 dBc/Hz / −145 dBc/Hz 10 kHz / −140 dBc/Hz / −155 dBc/Hz 50 kHz / −145 dBc/Hz / −157 dBc/Hz		Offset from Carrier / Standard / Ultra Low Noise Option (**L2**) 100 Hz / −105 dBc/Hz / −120 dBc/Hz 1 kHz / −115 dBc/Hz / −135 dBc/Hz 10 kHz / −120 dBc/Hz / −140 dBc/Hz 50 kHz / −125 dBc/Hz / −140 dBc/Hz	

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